CERTIFICATE OF VERIFICATION

I, Su Hyun LEE of 648-23 Yeoksam-dong, Kangnam-ku, Seoul, Korea state that the attached document is a true and complete translation to the best of my knowledge of the Korean-English language and that the writings contained in the following pages are correct English translations of the specifications and claims of the Korean Patent Application No. 2002-68822.

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Signature of translator: _____

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[ABSTRACT]

A substrate bonding apparatus for fabricating an LCD device is disclosed, in which it is possible to prevent the substrate from being sagging when absorbing and fixing the substrate to an upper stage. The substrate bonding apparatus for fabricating the LCD device includes upper and lower stages respectively having a plurality of cylindrical passages, for fixing respective substrates; vacuum absorbing means having one end mounted inside each passage of the stage to be projected to the external of the passage, for vacuum-absorbing the respective substrates; and a vacuum pump for providing a vacuum absorbing force to the vacuum absorbing means.

[TYPICAL DRAWINGS]

FIG. 3

[INDEX]

liquid crystal display device, substrate bonding apparatus, vacuum absorbing, substrate-sagging prevention

[SPECIFICATION]

[TITLE OF THE INVENTION]

STRUCTURE FOR LOADING SUBSTRATE IN SUBSTRATE BONDING APPARATUS FOR FABRICATING LIQUID CRYSTAL DISPLAY DEVICE

[BRIEF DESCRIPTION OF THE DRAWINGS]

FIG. 1 and FIG. 2 illustrate a substrate bonding apparatus for fabricating an LCD device according to the related art.

FIG. 3 schematically illustrates a structure for loading a substrate in a substrate bonding apparatus for fabricating an LCD device according to the present invention.

FIG. 4 to FIG. 7 schematically illustrate a substrate loading process in a substrate bonding apparatus for fabricating an LCD device according to the present invention.

Description of reference numerals for main parts in the drawings

110: upper stage	120: lower stage
131: pad	132: moving pipe
133: driving part	140: vacuum pump
150: sensing mean	210: first substrate
220: second substrate	300: loader part
310: finger	

[DETAILED DESCRIPTION OF THE INVENTION]

[OBJECT OF THE INVENTION]

[FIELD OF THE INVENTION AND DISCUSSION OF THE RELATED ART]

The present invention relates to a substrate bonding apparatus for fabricating a liquid crystal display (LCD) device having a liquid crystal dispensing method applied thereto, and more particularly, a structure for absorbing and fixing respective substrates to an upper stage to perform a bonding process of the respective substrates.

With development of information society, demands on displays increase gradually in a variety of forms, and, recently to meet the demands, different flat display devices, such as Liquid Crystal Display Device (LCD), Plasma Display Panel (PDP), Electro Luminescent Display (ELD), Vacuum Fluorescent Display (VFD), and the like, have been under development, and some of which are employed as displays in various apparatuses.

Among the flat displays, the LCD devices have been used the most widely as portable display devices while the LCD devices replace the CRT (Cathode Ray Tube) owing to features and advantages of excellent picture quality, light weight, thinness, and low power consumption.

Despite of the various technical developments on the LCD devices for serving as display devices in different fields, the studies for enhancing a picture quality of the LCD devices as display devices are inconsistent to the features and advantages of the LCD devices in many aspects. Therefore, for employing the LCD devices in various fields as general display devices, key of development of the LCD devices lies on whether the LCD devices can implement a high quality picture, such as a high definition,

a high luminance, and a large sized screen while the LCD devices have the features of light weight, thin profile, and low power consumption.

The LCD device is fabricated by a conventional liquid crystal injection in which sealant is patterned on one of the substrates to form an injection hole, the substrates are bonded in a vacuum, and liquid crystal is injected through the injection hole in the sealant, or by liquid crystal dispensing, suggested in Japanese Laid Open Patent Nos. 2000-284295 (Japanese Patent Application Hei11-089612) and 2000-005405 (Japanese Patent Application Hei11-172903), in which one substrate having the liquid crystal dispensed thereon and the other substrate are provided, and the substrates are put closer in up and down direction, and bonded together under vacuum.

FIG. 1 illustrates a substrate bonding apparatus having the related art liquid crystal dispensing method applied thereto. That is, the related art substrate bonding apparatus is provided with a frame 10 forming an outer appearance, stages 21 and 22, a sealant dispenser (not shown) and a liquid crystal dispenser 30, chambers 31 and 32, chamber moving means, and stage moving means. At this time, the stage has an upper stage 21 and a lower stage 22. The sealant dispenser and liquid crystal dispenser 30 is mounted at a side of a position in which the frame 10 carries out bonding. The chamber has an upper chamber unit 31 and a lower chamber unit 32, which are joinable together.

Also, the chamber moving means has a driving motor 40 for selective moving of the lower chamber unit 32 to a position S2 in which the bonding process is processed, or a position S1 in which the sealant and the liquid crystal dispensing are carried out. The stage moving means has a driving motor 50 for selective moving of the upper stage 21 to upward or downward.

Hereinafter, a process for fabricating an LCD device by using the related art substrate bonding apparatus will be described, according to a fabrication order in detail.

First, a first substrate 51 is attached to, and held at the upper stage 21 in a loaded state, and a second substrate 52 is attached to, and held at the lower stage 22 in a loaded state. Under this state, referring to FIG. 1, the lower chamber unit 32 having the lower stage 22 is moved to the position S1, for depositing sealant and dispensing liquid crystal by the chamber moving means 40.

In this state, as shown in FIG. 2, upon completing the sealant deposition and liquid crystal dispensing on the second substrate by the sealant dispenser and the liquid crystal dispenser 30, the second substrate is moved to a position S2 for bonding the substrates by the chamber moving means 40, again.

Then, the chamber units 31 and 32 are joined together by the chamber moving means 40, to enclose a space in which the stages 21 and 22 are positioned, and the space is maintained in a vacuum state by separate vacuum means. Under the vacuum state, the upper stage 21 is moved downward by the stage moving means 50 so that the first substrate 51 attached to, and held at the upper stage 21 comes closer to the second substrate 52 attached to, and held at the lower stage 22, and, as the stage moving means 50 is kept to move downward, the two substrates are bonded to each other, thereby completing fabrication of the LCD device.

[TECHNICAL TASKS TO BE ACHIEVED BY THE INVENTION]

However, the related art substrate bonding apparatus for fabricating the LCD device has the following disadvantages.

When the substrate is loaded by the loader part, some portions of the substrate are not supported by the fingers stably, whereby some portions of the substrate may be sagging. In this state, the process for absorbing and fixing the substrate to the upper stage is performed with the instantaneous vacuum absorbing force. That is, the portions of the substrate, having the narrow interval between the substrate and the upper stage, are easily fixed to the upper stage. Meanwhile, it is difficult to absorb and fix the portions of the substrate, having the wide interval between the substrate and the upper stage, to the upper stage.

In order to solve such a problem, if the excessive vacuum absorbing force is provided to the substrate, the substrate may be damaged. Especially, with trend of a large-sized LCD device, a size of a screen increases, so that it is necessary to prevent the substrate from being sagging in state of providing the appropriate vacuum absorbing force.

Accordingly, the present invention is directed to a structure for fixing a substrate to an upper stage in a substrate bonding apparatus for fabricating an LCD device that substantially obviates one or more problems due to limitations and disadvantages of the related art.

An object of the present invention is to provide a structure for fixing a substrate to an upper stage in a substrate bonding apparatus for fabricating an LCD device, in which it is possible to prevent the substrate from being sagging when absorbing and fixing the substrate to the upper stage.

[PREFERRED EMBODIMENTS OF THE INVENTION]

To achieve these objects and other advantages and in accordance with the purpose of the invention, as embodied and broadly described herein, a structure for loading a substrate in a substrate bonding apparatus for fabricating an LCD device includes upper and lower stages respectively having a plurality of cylindrical passages, for fixing respective substrates; vacuum absorbing means having one end mounted inside each passage of the stage to be projected to the external of the passage, for vacuum-absorbing the respective substrates; and a vacuum pump for providing a vacuum absorbing force to the vacuum absorbing means.

A structure for loading a substrate in a substrate bonding apparatus for fabricating an LCD device according to the preferred embodiment of the present invention will be described with reference to FIG. 3 to FIG. 7.

FIG. 3 to FIG. 7 schematically illustrate the structure for loading the substrate in the substrate bonding apparatus for fabricating the LCD device according to the preferred embodiment of the present invention.

Referring to FIG. 3 to FIG. 7, the substrate bonding apparatus for fabricating the LCD device according to the present invention is provided with an upper stage 110, a lower stage 120, vacuum absorbing means, a vacuum pump 140, and sensing means 150 for sensing an interval between respective stages 110 and 120 and respective substrates 210 and 220.

The upper and lower stages 110 and 120 absorb and fix the respective substrates 210 and 220. Herein, a plurality of passages 111 and 121 are respectively formed in the respective stages 110 and 120 to penetrate therethrough toward the stage surfaces fixing the respective substrates 210 and 220. Also, the vacuum absorbing means absorbs the respective substrates 210 and 220 to the respective stages 110 and

120 in a vacuum state. At this time, the vacuum absorbing means is provided with a plurality of pads 131, a plurality of moving pipes 132, and a plurality of driving parts 133. That is, each passage 131 has one vacuum hole 131a absorbing the respective substrates 210 and 220, and each moving pipe 132 is moved upward and downward for being connected to each vacuum hole 131a of the pad 131, and the vacuum pump 140. Also, each moving pipe 132 is moved inside each passage 111 and 121 of the stages 110 and 120 upward and downward, and each driving part 133 is provided for driving each moving pipe 132 upward and downward.

At this time, the pad 131 is at the same width with each passage 111 and 121, or narrower than each passage 111 and 121. Also, each moving pipe 132 has one end connected to the vacuum hole 131a of the pad 131, and the other end mounted for being moved inside each passage 111 and 121 by the driving part 133, and connected to a connection pipe 141 for the vacuum pump 140. The driving part 133 is formed of an actuator having the moving pipe 132 as an axis. In this case, the driving part 133 may be formed in a step motor or a linear motor, which have the moving pipe 132 as the axis. Further, the driving part 133 may have any structure for moving the moving pipe 132.

The vacuum pump 140 generates a vacuum absorbing force by pumping, and then transmits the vacuum absorbing force to each pad 131 through each moving pipe 132. The sensing means 150 senses an interval between the respective stages 110 and 120 and respective substrates 210 and 220. In the preferred embodiment of the present invention, the sensing means is formed as an interval check sensor. Also, a plurality of vacuum holes 112 and 122 are additionally formed in the respective stages 110 and 120 for receiving the vacuum absorbing force from the vacuum pump 140, and absorbing the respective substrates 210 and 220.

More specifically, the substrate loading process using the structure for loading the substrate in the substrate bonding apparatus having the aforementioned structure will be described with reference to FIG. 4 to FIG. 7 as follows.

As shown in FIG. 4, a loader part 300 loads the first substrate 210, on which a sealant is deposited, to a lower side of the upper stage 110. When loading the first substrate 210 by the loader part 300, it is possible to prevent the first substrate from being sagging at portions supported by fingers 310 of the loader part 300. However, the first substrate is sagging at portions between the respective fingers 310 in that the first substrate is not supported by the fingers 310. At this time, the vacuum pump 140 is driven, so that the vacuum absorbing force is provided through the vacuum holes 112 and 122 formed in the upper stage 110, thereby preventing the first substrate 210 from being sagging. In this state, predetermined portions of the first substrate 210 adjoining to the respective vacuum holes 112 and 122 are absorbed and fixed to the upper stage 110 as shown in FIG. 5.

Herein, some portions of the first substrate 210 are sagging, and it is impossible to absorb and fix the sagging portions of the first substrate 210 to the upper stage 110. On completing the loading process, as shown in FIG. 6, each driving part 133 (actuator) is driven, and then each moving pipe 132 is moved downward. Each moving pipe 132 may be moved downward at a preset distance. Preferably, each moving pipe 132 is moved downward according to the interval between the upper stage 110 and the first substrate 210 by the sensing means 150 (interval check sensor).

When each moving pipe 32 is moved downward at the preset distance, the vacuum absorbing force is transmitted to the vacuum hole 131a of each pad 131 through

each moving pipe 132 according to driving of the vacuum pump 140. As a result, the first substrate 210 is absorbed to the pads 131 by the vacuum absorbing force.

After that, each driving part 133 is driven again, whereby each moving pipe 132 is moved upward to an initial state, and then the driving part 133 is stopped. Thus, the first substrate 210 is absorbed and fixed for being in parallel to the upper stage 110, as shown in FIG. 7.

Meanwhile, on completing absorbing and fixation of the first substrate 210, the second substrate 220 is loaded. After unloading of the loader part 300, the loader part 300 fixing the second substrate 200 is loaded into the space between the respective stages 110 and 120.

At this time, the process for absorbing and fixing the second substrate 220 loaded by the loader part 300 to the lower stage 120 is performed in the same method as that for absorbing and fixing the first substrate 210 to the upper stage 110, whereby the explanation of the process for absorbing and fixing the second substrate 220 to the lower stage 120 will be omitted.

Herein, the process for absorbing and fixing the second substrate 220 loaded by the loader part 300 to the lower stage 120 may be different from the process for absorbing and fixing the first substrate 210 to the upper stage 110. Then, the bonding process is performed to the respective substrates 210 and 220 fixed to the corresponding stages 110 and 120.

[ADVANTAGES OF THE INVENTION]

As mentioned above, the structure for loading the substrate in the substrate bonding apparatus for fabricating the LCD device according to the present invention has the following advantages.

Even though some portions of the substrate are sagging during loading the substrate, the pad of the vacuum absorbing mean moved downward absorbs the sagging portions of the substrate, so that it is possible to prevent the loaded substrate from being sagging.

Also, the process for absorbing and fixing the substrate to the upper stage is performed without the excessive vacuum absorbing force, whereby it is possible to prevent the substrate from being damaged during the loading process.

It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention. Thus, it is intended that the present invention covers the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

What is claimed is:

1. A structure for loading a substrate in a substrate bonding apparatus for fabricating an LCD device comprising:

upper and lower stages respectively having a plurality of cylindrical passages, for fixing respective substrates;

vacuum absorbing means having one end mounted inside each passage of the stage to be projected to the external of the passage, for vacuum-absorbing the respective substrates; and

a vacuum pump for providing a vacuum absorbing force to the vacuum absorbing means.

2. The structure of claim 1, wherein the vacuum absorbing means includes:

a pad having a vacuum hole for absorbing the substrate;

a moving pipe connected to the vacuum hole of the pad and the vacuum pump, for being moved inside the passage of the stage upward and downward; and

a driving part for moving the moving pipe upward and downward.

3. The structure of claim 2, wherein the driving part is formed of an actuator having the moving pipe serving as an axis.

4. The structure of claim 2, wherein the driving part is formed of a step motor having the moving pipe serving as an axis.

5. The structure of claim 1, further comprising sensing means for sensing an interval between the stage and the substrate.

6. The structure of claim 5, wherein the sensing means is formed of an interval check sensor.

7. The structure of claim 1, wherein the respective stages further includes a plurality of vacuum holes for receiving a vacuum absorbing force from the vacuum pump, and absorbing and fixing the respective substrates.